SUPPORTING INFORMATION

Exposure to Bisphenol A, Bisphenol F, and Bisphenol S in U.S. Adults and Children: the National Health and Nutrition Examination Survey 2013-2014

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Table S1. Sources and URLs for data analyzed in this study.

Variable	File name	URL
BPA, BPF, and BPS	Personal Care and Consumer Product Chemicals and Metabolites	https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Laboratory&CycleBeginYear=2013
Age, gender, race/ethnicity, education, family income	Demographic Variables and Sample Weights	https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Demographics&CycleBeginYear=2013
Smoking status	Smoking - Cigarette Use	https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Questionnaire&CycleBeginYear=2013
Physical Activity	Physical Activity	https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Questionnaire&CycleBeginYear=2013
Alcohol intake	Alcohol use	https://wwwn.cdc.gov/Nchs/Nhanes/2013-2014/ALQ_H.htm

Table S2. Urinary concentration of BPA, BPF and BPS in U.S. adults in NHANES 2013-2014. Levels were adjusted for creatinine.

Variable	N	BPA, µg/g creatinine			BPF, µg/g creatinine			BPS, µg/g creatinine		
		Median (P25-P75)	P	Detection rate (%)	Median (P25-P75)	P	Detection rate (%)	Median (P25-P75)	P	Detection rate (%)
All	1,808	1.20 (0.73-2.09)		95.0	0.46 (0.21-1.06)		66.5	0.39 (0.21-0.84)		89.4
Age										
20-39 years	598	1.15 (0.71-2.10)		96.2	0.40 (0.17-1.05)		67.9	0.36 (0.21-0.73)		89.5
40-59 years	607	1.24 (0.73-2.07)	0.81	93.8	0.49 (0.22-0.97)	0.049	65.3	0.41 (0.21-0.83)	0.08	89.4
≥60 years	603	1.23 (0.75-2.10)		95.1	0.48 (0.21-1.23)		66.4	0.41 (0.21-1.00)		89.3
Gender										
Male	851	1.08 (0.68-1.92)	0.01	96.6	0.41 (0.18-0.98)	0.051	70.6	0.34 (0.18-0.80)	0.01	91.4
Female	957	1.27 (0.78-2.22)		93.5	0.50 (0.24-1.08)		62.7	0.43 (0.25-0.88)*		87.6
Race/ethnicity[a]										
Non-Hispanic white	757	1.21 (0.71-2.09)		94.6	0.52 (0.23-1.10)		69.0	0.37 (0.21-0.77)		87.9
Hispanic	702	1.21 (0.78-2.18)	0.51	96.3	0.31 (0.16-0.71)	0.02	59.2	0.49 (0.23-0.88)	0.03	91.0
Non-Hispanic black	383	1.25 (0.79-2.10)		97.2	0.34 (0.15-1.01)		67.9	0.47 (0.21-1.05)		94.8
Other	266	1.03 (0.61-1.88)		93.0	0.35 (0.19-0.84)		57.5	0.41 (0.20-0.87)		90.8
Education[b]										
Less than high school	429	1.35 (0.78-2.22)		94.2	0.38 (0.19-1.02)		62.0	0.46 (0.22-1.02)		90.9
High school	406	1.23 (0.78-2.15)	0.99	96.5	0.49 (0.23-1.24)	0.09	69.2	0.41 (0.23-0.91)	0.23	90.3
College or higher	973	1.14 (0.70-2.03)		94.7	0.47 (0.21-1.02)		66.8	0.37 (0.20-0.76)		88.7
Family income to poverty ratio[c]										
<1.30	574	1.31 (0.78-2.34)		95.6	0.40 (0.19-0.89)		65.9	0.41 (0.22-0.94)		90.4
1.30-3.50	564	1.21 (0.75-1.91)	0.03	96.6	0.50 (0.21-1.25)	0.03	69.8	0.40 (0.22-0.79)	0.56	91.1
>3.50	514	1.11 (0.71-2.05)		93.0	0.50 (0.21-1.00)		66.0	0.35 (0.19-0.76)		87.6
Missing	156	1.11 (0.69-2.28)		96.3	0.36 (0.21-0.72)		57.4	0.42 (0.21-0.99)		87.8
Smoking[d]										
Never smoker	1028	1.13 (0.70-1.93)		94.8	0.44 (0.18-0.97)		63.1	0.37 (0.20-0.78)		89.1
Current smoker	365	1.32 (0.85-2.32)	<0.001	96.5	0.49 (0.24-1.09)	0.21	72.1	0.42 (0.22-0.95)	0.003	90.5
Ever smoker	415	1.22 (0.71-2.26)		94.2	0.50 (0.23-1.33)		70.1	0.40 (0.21-0.80)		89.2

Physical activity, metabolic equivalent of task (MET)-min/week[e]	N									
<600	767	1.16 (0.70-1.95)		94.3	0.48 (0.23-1.08)		66.9	0.38 (0.21-0.88)		90.4
600-1200	206	1.12 (0.72-1.92)	0.91	95.0	0.50 (0.18-1.07)	0.87	65.6	0.41 (0.24-0.93)	0.97	87.1
>1200	835	1.24 (0.77-2.26)		95.6	0.42 (0.20-1.02)		66.4	0.40 (0.21-0.80)		89.1
Alcohol intake										
Non-drinker	1243	1.25 (0.75-2.07)		94.6	0.48 (0.21-1.10)		66.0	0.41 (0.21-0.82)		88.4
Moderate drinker	136	1.02 (0.68-1.95)		96.9	0.37 (0.18-0.79)		68.3	0.25 (0.16-0.55)		88.1
Heavy drinker	269	1.15 (0.80-2.33)	0.89	97.2	0.44 (0.21-0.99)	0.22	67.8	0.38 (0.22-0.85)	0.0004	92.1
Missing	158	1.00 (0.60-1.90)		91.3	0.37 (0.20-0.96)		66.3	0.44 (0.24-1.24)		94.4

All the variables were adjusted using population weights for the sample in which BPA concentration was measured except N (unweighted sample size). Analysis of variance (ANOVA) was used to compare differences of urinary concentrations of BPA, BPF, and BPS among various categorical variables.

[a] Race/ethnicity was categorized based on self-reported data into Hispanic (including Mexican and non-Mexican Hispanic), non-Hispanic white, non-Hispanic black and other race/ethnicity.[1]

[b] Self-reported education was grouped as less than high school, high school, and college or higher.[1]

[c] Family income to poverty ratios were categorized as ≤ 1.30, 1.30-3.50, and > 3.50.[1-2]

[d] Self-reported smoking was classified as never smokers who smoked less than 100 cigarettes in their lifetime; current smokers who currently smoke cigarettes; and ever smokers who smoked more than 100 cigarettes in their lifetime but don't smoke currently.[1]

[e] Self-reported physical activity was used to derive metabolic equivalent of task (MET) minutes per week according to the Global Physical Activity Questionnaire Analysis Guide[3] and categorized as <600, 600-1,200 and >1,200 MET-min/week.[1]

[f] Alcohol intake was categorized as non-drinker (0 g/day), moderate drinker (0.1-28 g/day for men, 0.1-14 g/d for women), or heavy drinker (≥ 28 g/day for men, ≥ 28 g/day for women).[4]

Table S3. Association of demographic and lifestyle factors in adults (N=1,808) from NHANES 2013-2014 with urinary BPA, BPF, and BPS concentrations.

Variable	BPA		BPF		BPS	
	β coefficient	P	β coefficient	P	β coefficient	P
Age						
20-39	[ref]		[ref]		[ref]	
40-59	0.03	0.61	0.08	0.52	0.10	0.26
≥60	0.04	0.55	0.09	0.46	0.24	0.07
Gender						
male	[ref]		[ref]		[ref]	
female	0.15	0.005	0.18	0.04	0.21	0.01
race/ethnicity[a]						
Non-Hispanic white	[ref]		[ref]		[ref]	
Hispanic	0.005	0.95	-0.34	0.07	0.23	0.03
Non-Hispanic black	-0.003	0.95	-0.27	0.03	0.19	0.07
Other	-0.107	0.24	-0.31	0.08	0.12	0.27
Education[b]						
Less than high school	[ref]		[ref]		[ref]	
High school	0.007	0.96	0.10	0.43	-0.03	0.67
College or higher	-0.085	0.31	-0.08	0.59	-0.12	0.27
Family income to poverty ratio[c]						
<1.30	[ref]		[ref]		[ref]	
1.30-3.50	-0.10	0.04	0.32	0.006	0.04	0.66
≥3.51	-0.10	0.06	0.23	0.04	-0.01	0.92
Missing	-0.07	0.49	0.13	0.59	0.11	0.49
Smoking[d]						
Never smoker	[ref]		[ref]		[ref]	
Current smoker	0.20	0.01	0.15	0.33	0.16	0.04
Ever smoker	0.13	0.06	0.17	0.16	0.12	0.14
Physical activity, MET-min/week[e]						
<600	[ref]		[ref]		[ref]	
600-1200	0.04	0.45	0.11	0.40	0.04	0.74
>1200	0.17	0.006	-0.03	0.73	0.05	0.36
Alcohol intake [f]						
Non-drinker	[ref]		[ref]		[ref]	
Moderate drinker	-0.03	0.69	-0.07	0.63	-0.27	0.003
Heavy drinker	0.07	0.23	-0.22	0.26	0.09	0.30
Missing	-0.19	0.03	-0.02	0.92	0.14	0.11

[a] Race/ethnicity was categorized based on self-reported data into Hispanic (including Mexican and non-Mexican Hispanic), non-Hispanic white, non-Hispanic black and other race/ethnicity.[1]

[b] Self-reported education was grouped as less than high school, high school, and college or higher.[1]

[c] Family income to poverty ratios were categorized as ≤ 1.30, 1.30-3.50, and > 3.50.[1-2]

[d] Self-reported smoking was classified as never smokers who smoked less than 100 cigarettes in their lifetime; current smokers who currently smoke cigarettes; and ever smokers who smoked more than 100 cigarettes in their lifetime but don't smoke currently.[1]

[e] Self-reported physical activity was used to derive metabolic equivalent of task (MET) minutes per week according to the Global Physical Activity Questionnaire Analysis Guide[3] and categorized as <600, 600-1,200 and >1,200 MET-min/week.[1]
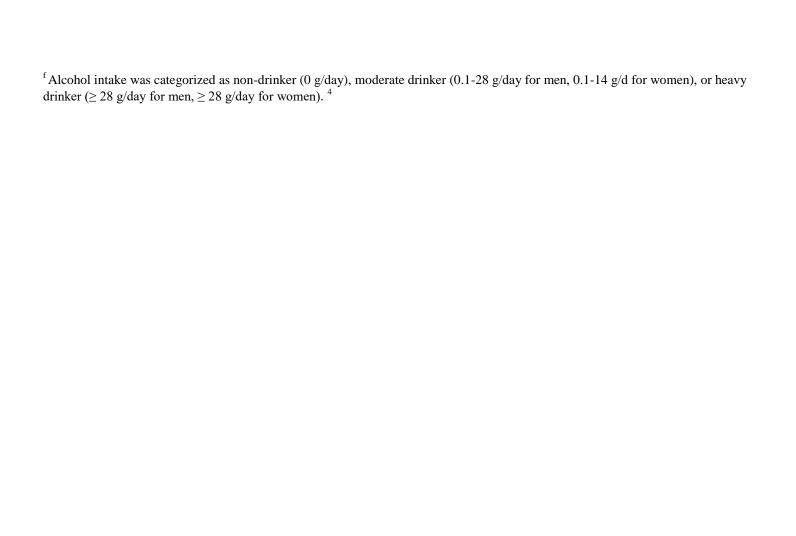
[f] Alcohol intake was categorized as non-drinker (0 g/day), moderate drinker (0.1-28 g/day for men, 0.1-14 g/d for women), or heavy drinker ($\geq$ 28 g/day for men, $\geq$ 28 g/day for women). [4]

Table S4. Urinary concentration of BPA, BPF and BPS in U.S. children in NHANES 2013-2014. Levels were adjusted for creatinine.

Variable	N	BPA, µg/g creatinine			BPF, µg/g creatinine			BPS, µg/g creatinine		
		Median (P25-P75)	P	Detection rate (%)	Median (P25-P75)	P	Detection rate (%)	Median (P25-P75)	P	Detection rate (%)
All	868	1.26 (0.74-2.19)		98.2	0.41 (0.17-1.08)		65.4	0.33 (0.18-0.67)		89.0
Age										
6-11 years	409	1.80 (1.05-3.08)	<0.001	97.3	0.45 (0.19-1.18)	0.16	62.9	0.40 (0.21-0.78)	0.002	88.3
12-19 years	459	0.93 (0.60-1.71)		98.9	0.38 (0.15-1.04)		67.3	0.29 (0.16-0.58)		89.5
Gender										
Male	429	1.22 (0.67-2.13)	0.20	97.8	0.37 (0.16-1.06)	0.47	61.9	0.31 (0.16-0.61)	0.02	89.1
Female	439	1.28 (0.80-2.33)		98.5	0.46 (0.21-1.18)		69.1	0.36 (0.19-0.74)		88.8
Race/ethnicity[a]										
Non-Hispanic white	229	1.20 (0.67-2.13)		98.6	0.49 (0.19-1.40)		69.9	0.31 (0.17-0.57)		86.4
Hispanic	286	1.29 (0.75-2.26)	0.51	98.2	0.30 (0.16-0.65)	0.02	58.3	0.44 (0.20-0.94)	0.03	91.2
Non-Hispanic black	223	1.33 (0.87-2.35)		99.1	0.36 (0.14-0.89)		67.2	0.31 (0.17-0.64)		95.4
Other	130	1.16 (0.72-1.95)		94.5	0.37 (0.17-0.72)		55.0	0.34 (0.20-0.71)		86.4
Family income to poverty ratio[b]										
<1.30	406	1.44 (0.84-2.48)		99.0	0.37 (0.17-0.89)		60.8	0.34 (0.17-0.77)		88.5
1.30-3.50	236	1.28 (0.77-2.21)	0.03	97.8	0.46 (0.16-1.34)	0.03	67.1	0.32 (0.17-0.63)	0.56	89.5
>3.50	154	1.04 (0.61-1.87)		97.	0.41 (0.19-1.09)		7.3	0.27 (0.17-0.58)		88.7
Missing	72	0.97 (0.55-1.40)		100.0	0.31 (0.12-0.77)		58.0	0.40 (0.25-1.09)		88.5

All the variables were adjusted using population weights for the sample in which BPA concentration was measured except N (unweighted sample size). Analysis of variance (ANOVA) was used to compare differences of urinary concentrations of BPA, BPF, and BPS among various categorical variables.
[a] Race/ethnicity was categorized based on self-reported data into Hispanic (including Mexican and non-Mexican Hispanic), non-Hispanic white, non-Hispanic black and other race/ethnicity.[1]
[b] Family income to poverty ratios were categorized as ≤ 1.30, 1.30-3.50, and > 3.50.[1-2]

Table S5. Association of demographic factors in children (N=868) from NHANES 2013-2014 with urinary BPA, BPF, and BPS concentrations.

Variable	BPA		BPF		BPS	
	β coefficient	P	β coefficient	P	β coefficient	P
Age						
6-11	[ref]		[ref]		[ref]	
12-19	-0.55	<0.0001	-0.16	0.13	-0.31	0.004
Gender						
Male	[ref]		[ref]		[ref]	
Female	0.09	0.13	0.15	0.39	0.20	0.02
Race/ethnicity[a]						
Non-Hispanic white	[ref]		[ref]		[ref]	
Hispanic	-0.06	0.52	-0.42	0.0006	0.30	0.05
Non-Hispanic black	0.06	0.60	-0.31	0.14	0.07	0.64
Other	-0.08	0.51	-0.34	0.10	0.07	0.55
Family income to poverty ratio[b]						
<1.30	[ref]		[ref]		[ref]	
1.30-3.50	-0.15	0.0503	0.05	0.74	0.03	0.85
≥3.51	-0.28	0.03	0.05	0.64	-0.10	0.17
Missing	-0.42	0.0006	-0.25	0.16	0.39	0.006

[a] Race/ethnicity was categorized based on self-reported data into Hispanic (including Mexican and non-Mexican Hispanic), non-Hispanic white, non-Hispanic black and other race/ethnicity.[1]
[b] Family income to poverty ratios were categorized as ≤ 1.30, 1.30-3.50, and > 3.50.[1-2]

References

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